MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

FIRST SEMESTER EXAMINATION FOR DIPLOMA IN MECHANICAL ENGINEERING

MED –PR 308:METROLOGY AND INDUSTRIAL MEASUREMENTS II

DATE: 27/4/2016 **TIME: 8:30 – 10:30 AM**

INSTRUCTIONS:

- ***This examination contains two sections A and B***
- ***Section A is compulsory***
- ***Attempt any other two questions from section B***

SECTION A (COMPULSORY) - 30 MARKS

1. a) State any four factors to consider in the selection of a screw thread. (4 marks)

   b) Define the following terms as used in the measurement of screw threads.

      i) Pitch
      ii) Thread angle
      iii) Crest
      iv) Root
      v) Flank (10 marks)

   c) Describe the following pitch errors in screw threads

      i) Thread drunkenness
      ii) Periodic pitch error
      iii) Progressive pitch error (9 marks)

d) Show that the formula for the calculation of simple effective diameter for an ISO screw thread is given by;

Ed=T+ p/2 cot ɵ - d(cosec ɵ-1) where;

Ed=simple effective diameter

P=nominal pitch

d=wire diameter
ɵ =Semi angle of the thread (7 marks)

SECTION B(ATTEMPT ANY TWO QUESTIONS FROM THIS SECTION)

2. a) Define the following terms with reference to gears.

i) Addendum

ii) Diametral pitch

iii) Dedendum(6 marks)

b) (i) Show that the expressions for the calculations of both W and h for a gear tooth measured along the pitch line is given by;

W=NM sin $(\frac{90}{T})°$ where

w=Tooth thickness

N=Number of teeth (5 marks)

M=Module

h=Depth from the top of the tooth

(ii) Show that the depth from the top of the tooth for the above value of w is given by

h= $\frac{\mathrm{NM}}{2}$ [1+ $\frac{2}{N}$ – cos($\frac{90}{N}$)°] (5 marks)

c) Calculate the gear tooth vernier settings w and h to measure a gear of 133 teeth and module 3mm. (4 marks)

3. a) With the aid a sketch explain the working principle of a gear tooth vernier for the measurement of tooth thickness. (10 marks)

b) With the aid of a labeled sketch describe the principle of operation of a rolling type gear testing machine. (10 marks)

4. a) Explain the effect of surface texture on the following;

i) Fatigue life

ii) Bearing properties

iii) Wear (6 marks)

b) With the aid of sketches explain the principle of operation of the following methods of measuring surface texture

i) Tomlinson surface metre (7 marks)

ii) Talysurf (7 marks)

5. a) With the aid of a sketch describe the following methods of analyzing surface texture

i) center line average (CLA)

ii) Root mean square method (RMS)

iii) Peak to valley height (15 marks)

b) In an experiment to determine the texture of a surface to the summation of all the areas of the traces was 256mm^2 over a length of 25mm.if the vertical magnification was x20000calculate the surface roughness in micrometers using the center-line average (C.L.A) technique. (5 marks)